The benefits of TTF liquidity

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Contact

Name (oliver.rix@baringa.com +44 7790 017576)

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Executive Summary

Over the last few years, wholesale gas trading volumes at the TTF ("Title Transfer Facility") in the Netherlands have been rising such that it is now by some measures the most liquid European gas hub. In the context of considerations around the evolution of the Dutch market in light of production caps on Groningen following recent seismic activity, the Authority for Consumers & Markets (ACM) has commissioned Baringa Partners to write this report highlighting the benefits liquidity brings.

Whilst the original development of the Dutch gas industry following the 1959 discovery of Groningen was driven through a single entity, Gasunie, as the sole buyer and distributor, the process of liberalisation that started in Europe in the 1980's has placed wholesale markets at the centre of a competitive production and retail environment, with unbundled networks operating under strong economic regulation. Such markets may be defined as liquid if participants are able to contract efficiently to buy or sell gas at a fair price, without causing undue change in the market pricing level.

Liquid markets typically develop around trading of products that are standard in terms of delivery location, time periods, and quality. They enable price formation through the participation of many buyers and sellers, both through bilateral trading with price reporting, and through exchanges, supported by clear and well-governed market rules. Liquidity is demonstrated through high traded volumes relative to underlying demand, and a small difference between the buy price and the sell price (the bid-offer spread), as well as confidence in the stability of the market and the use of reference prices as benchmarks for settling financial products and in contract indexation terms.

Dutch production is still dominated by Groningen gas, which has an unusually low calorific value. A separate physical network has been developed to supply this gas largely to the residential market, linked through blending facilities with the "Hi-Cal" system. Gas is traded at a virtual trading hub known as the Title Transfer Facility (TTF), set up by Gasunie in 2002. Early trading volumes were limited until Gasunie was unbundled (in 2005) and quality conversion issues were hidden from the traded market through a regulatory decision in 2008 to make this a system service managed by the network business, GTS. Since then traded volumes and market participants have risen strongly, bid-offer spreads have fallen, and TTF has become the clear continental price benchmark, used extensively as a contractual reference.

The Netherlands benefits directly from this strong TTF liquidity. It helps foster competition across the value chain and provides the means for participants to manage their portfolios effectively through transparent price formation and low transaction costs. In turn, this helps lower costs to consumers through efficient resource use and investment decisions, and provides confidence for suppliers and investors, enhancing security of supply. The lower costs of production for industry and enhanced purchasing power for consumers, as well as confidence in future energy supply, support economic growth.

Reduced production from Groningen can be replaced by increased imports, in combination with blending to manage Lo-Cal requirements. The liquidity of the TTF is an important element in ensuring that the market can respond effectively through this transition. Against a more general background of increasing European import dependence, liquidity will be a key factor in attracting gas from broader global markets. It is therefore important that the underlying factors that have supported the growth in liquidity are preserved through the transition, maintaining confidence in a strong wholesale market.

1 Introduction

Over the last few years, wholesale gas trading volumes at the TTF ("Title Transfer Facility") in the Netherlands have been rising such that it is now by some measures the most liquid European gas hub. This has in part been due to the underlying physical characteristics of the Dutch market, with its large domestic production volumes, particularly from the Groningen field, landing points for Norwegian gas, and high levels of interconnection to surrounding markets.

The seismic activity that has developed as a result of gas extraction from Groningen has led to the introduction of significant constraints on future production volumes. In that context, the Authority for Consumers & Markets (ACM) has commissioned Baringa Partners to write this report highlighting the benefits that flow from a liquid TTF hub, to help ensure that this is given due consideration as policy makers determine how best to respond to a different future supply mix. We have considered this within the context of the current European model of wholesale markets, and it has not been within our scope to assess benefits or disbenefits of this model compared to any alternative arrangements, or to provide any policy recommendations.

The structure of this report is as follows.

- This Section 1 introduces the report
- Section 2 examines the role of the market in the liberalized gas industry
- Section 3 defines liquidity and outlines the key characteristics of a liquid gas market
- Section 4 sets out how liquidity can be measured
- Section 5 provides background context on the Dutch gas sector
- Section 6 assesses the liquidity of the Dutch TTF market
- Section 7 outlines the benefits of a liquid gas market for The Netherlands and North-West Europe
- Section 8 explores the impact on liquidity of recent and future developments
- Section 9 presents our conclusions

2 The role of a gas market in the liberalised gas industry

In recent years, markets have become increasingly central to the operation of the gas industry in the Netherlands and across Europe. Historically, however, the Dutch gas industry largely developed in the absence of organised markets for gas trading. In this section, we summarise the drivers for liberalising the gas industry and the role played by markets.

The discovery of the giant Groningen field in 1959 presented the Netherlands with an enormous challenge. This was a potential source of wealth but there was no infrastructure to start using and monetising it. Huge investments needed to be made in exploration and production, in pipelines and in the conversion of appliances. A structure was set up whereby a single entity, Gasunie, was the sole buyer and distributer of Groningen gas. This structure delivered the infrastructure that has supported one of the highest penetrations of natural gas in Europe, at over 95% of all potential connections, and gave the Netherlands a central position in the European gas industry.

The EU drive to liberalise the energy industry started in the 1980's. The objective was to improve the competitiveness of the European industry by lowering the costs of energy. Energy costs were deemed unnecessarily high due to inefficiencies of the pre-liberalization structure, including:

- a lack of competitive pressure and/or economic regulatory oversight,
- a corresponding lack of responsiveness to market and customer demands, and
- high barriers to entry due to a lack of transparency around infrastructure access and commodity pricing.

The liberalisation of the energy markets was built on the following concepts:

Introduction of competition

Central to liberalisation was the introduction of competition across the supply chain, from production through shipping to supply. The exception was the gas networks, which were considered "natural monopolies", best owned by companies operating under licence, and regulated by an independent body.

Access to infrastructure

To support competition in the production and supply of gas, third party access arrangements are central to ensure that market participants have the ability to utilise transmission and distribution networks on a fair and transparent basis. Unbundling of networks from integrated businesses – either on a functional, legal, or ownership basis - has supported this process.

Open wholesale markets

Competition drives a need to exchange title for gas between market participants more frequently, in response to changing supply and demand conditions, or evolving market shares. This shorter term trading developed alongside the traditional long term contracts between producers and distributers. Standard products take the form of a future obligation to buy or sell title to gas at a specific delivery location, supported by clear regulation and legal and contractual structures. Market participants transact for a range of reasons, including selling production or import volumes, purchasing to meet customer needs, balancing physical positions, or trading speculatively.

Price formation

In the pre-liberalization market the allocation of resources was based on planning of physical quantities by the relevant monopoly. Prices were not the result of the competition between gas suppliers but the result of the comparison between gas and competing fuels (mainly oil products). This meant that gas prices were typically indexed to the oil market. Initially this made sense as gas was substituting oil and customers needed to be assured that gas was competitive. But as gas prices followed the developments in the oil market, they gave no price signal relevant to natural gas supply and demand or to the need for gas infrastructure. However, as wholesale gas markets have developed, the prices that are formed have become increasingly central to decision-making by market participants, influencing both short term decisions (around gas flows) and long term decisions (around investment in infrastructure).

3 Liquidity and wholesale gas markets

3.1 What is liquidity?

Liquidity is the functioning of a market that provides participants with the ability to contract with confidence to buy or sell gas for a future delivery period for the volume they require, at a fair market price, without causing undue change in the market pricing level, and at a reasonable cost for transacting. Liquidity therefore provides participants with:

- the means to contract forward at reasonable pricing levels, allowing them to offer fixed price tariffs and contracts to their customers,
- the means to hedge earnings risk on upstream production,
- the ability to manage and balance portfolios as positions change,
- reliable reference prices for settling financial contracts,
- effective price signals for operational decisions, and
- reliable price signals for new investment decisions.

3.2 What are characteristics of liquid markets?

Well-functioning wholesale gas markets are characterised by a range of qualities that support the liquidity market participants require to buy and sell with confidence the physical volumes, or the financial instruments, which they need to manage their portfolios.

The ability to transact based on standard products

No market has a function without effective access to at least one product or service. Commodity markets have developed liquidity through the trading of standard products, as this provides transparency and supports clear price formation. For natural gas, this is achieved by standardising around a specific set of forward delivery periods (for example months, quarters, seasons and years), and by agreeing a fixed deemed calorific value when title is transferred (despite the variation in physical calorific value that actually occurs within pipelines).

For a market to be meaningful, the products should align with the needs of market participants. Hence the range of products should provide sufficient coverage of delivery periods over needed time horizons. The product lengths should also meet participant needs – typically with increasingly shorter lengths for products traded closer to delivery (such as day-ahead, balance-of-week and balance-of-month).

Appropriate delivery points

Due to the strong dependence on specific infrastructure the delivery point matters a lot in the gas market. In Europe, the market has developed such that delivery points are not specific physical locations on the network, but rather “virtual” points within a defined market area. Market

participants can exchange title for gas at these virtual points, irrespective of the particular entry or exit points they may have used to deliver or receive the commodity.

In regions where gas wholesale markets have developed strongly, trading is typically focused at a small number of delivery points, often referred to as "hubs". Where there is no transportation constraint between these hubs and other delivery locations, then the market price is effectively common to both. Where transportation constraints are present, then the price at an alternative location may be different, and a "basis" exists. This creates a risk for market participants with physical positions in the alternative location. They may choose to manage this, for example either by trading directly at that location, or by executing a swap between the hub and the alternative location.

A hub should ideally have multiple supply sources and multiple exit points, as well as connected storage. This will ensure that the hub is directly relevant for a range of players managing physical positions, forming the foundation for trading. In the United States, the Henry Hub is in Louisiana, but forms the main price reference for the rest of the country. Market participants make use of swaps to manage the basis risk, where needed, to other physical locations around the country. It is likely that the European Gas Target Model will evolve in this type of way, meaning that only a small number of very liquid hubs would be expected to develop through a gradual process of selection based on the choices and behaviours of market participants.

Sufficient participants

Transactions only take place where there are interested buyers and sellers. Producers will be generally on the selling side of the market, whereas industrial customers, utilities and power generators are generally on the buy side. Traders are by definition on either side. Multiple players on either side are needed to make a market work effectively. Market makers can often play a key role. These are participants that are committed always to providing bids and offers so that transactions can be done.

Cost effective routes to market

Market participants will typically have a choice in the way that they trade gas, and this competition helps keep transaction costs low. Gas may be traded "over the counter" (OTC), meaning that counterparties transact bilaterally, either directly or through a broker, or via an exchange. In the first case the counterparties rely directly on each other for performance of the contract, and face the associated credit risk. In the latter case the exchange is the direct counterparty. The market participant faces a very low credit risk but will be subject to strict margining (whereby the participant must post cash ahead of settlement to a level which covers their potential future loss).

Price reporting

Good price reporting is essential to support transparent price discovery and to offer credibility and assurance that the market is functioning effectively. This will often occur in a variety of ways. For trading that takes place bilaterally between participants, price reporting services will conduct daily surveys of the prices of standard products that have been transacted, according to a strict set of guidelines, based on which they publish a series of bid/offer quotes for each forward product. Where gas trading occurs on an exchange, the resulting aggregate volumes and prices will be available both to direct participants and the market more broadly.

Market depth

The published prices on the traded market have to be reflective of the prices that market participants find themselves actually able to transact against. Good reporting itself is not sufficient. One of the important aspects of a liquid market is that a single transaction of a typical size does not materially move the price. Without this depth, the market is not a reliable instrument for pricing and for risk management.

Transparency

Confidence in markets is based on transparency of the processes surrounding price formation, supported by clear and well-governed market rules and an absence of market manipulation. Due to the physical characteristics of natural gas, and the complexity of managing competition across a single network infrastructure, the market rules are by necessity extensive. These rules have a significant influence on the functioning of the market. If they are not developed in a stable and considered way, then market participation may be deterred and liquidity damaged.

4 Measuring liquidity

Although liquidity is a critical feature of efficient and competitive markets, it is difficult to define or measure precisely. Liquidity is a broad concept, combining objective attributes which can be readily measured with more qualitative aspects related to reputation and trust. Here we outline a range of liquidity measures, both objective and more qualitative.

4.1 Objective measures

Traded volumes

A basic measure of liquidity is the volume of gas traded at a hub. This should be considered for the full set of standard products, from short term delivery (day-ahead and within-day) to long term (years ahead). Liquidity often varies significantly for products with different times to delivery. The number of transactions per product is an additional useful metric, particularly as the size in energy terms of traded products will vary significantly (from gas delivered for a single day to an obligation for a year or more).

Churn

The measure of churn relates the traded volume to the underlying size of the gas market, measured by customer demand. Churn is typically reported as the volume of gas traded in the wholesale market as a multiple of customer demand for a year. In normalising for the size of the market, it provides for a more direct benchmarking of liquidity between different hubs.

Number of parties

Prices generated in trades on a market limited to a few counterparties will always be subject to suspicion of manipulation. The more players with different positions meet on the market the more the resulting pricing will be seen as the true result of supply and demand.

Spread

In a market with many well-informed participants on both sides, supply and demand should be well aligned. This in turn is expressed in a small difference between prices on the bid and offer side of the market: the spread. Spread is then one of the measures of liquidity.

Volatility

Prices that are the result of supply and demand would be expected to move based on changing demand and supply factors. This creates price volatility, apparent from movements in reported prices through time. More extreme volatility that appears to be unrelated to underlying fundamentals may be a sign of a lack of liquidity.

4.2 Qualitative measures

Confidence in the regulatory and policy environment

The perception of the future state of the market amongst participants is an important qualitative liquidity measure. A high level of confidence amongst trading parties that the market will continue to function well, free from "surprises" on the part of regulators and policy-makers, will support the behaviours and decisions that underlie the objective measures described above. Such confidence is built up over time through consistent development of the market and through consistent support by its stakeholders.

Level of consensus within the trading community

A traded market becomes part of the culture of the trading community, both behaviourally and contractually. Through informal engagement and more formal interaction through conferences and industry gatherings, consensus will tend to build around the "state" of a given market, and this in turn presents a useful measure of liquidity. More structurally, the market reference price will become part of the specifications used by price reporting agencies, and be formally used within contracts, for example as a price index for supply agreements, and as a reference for insurers for linking damage provisions. The level to which this has happened provides a qualitative measure of the robustness of liquidity in particular.

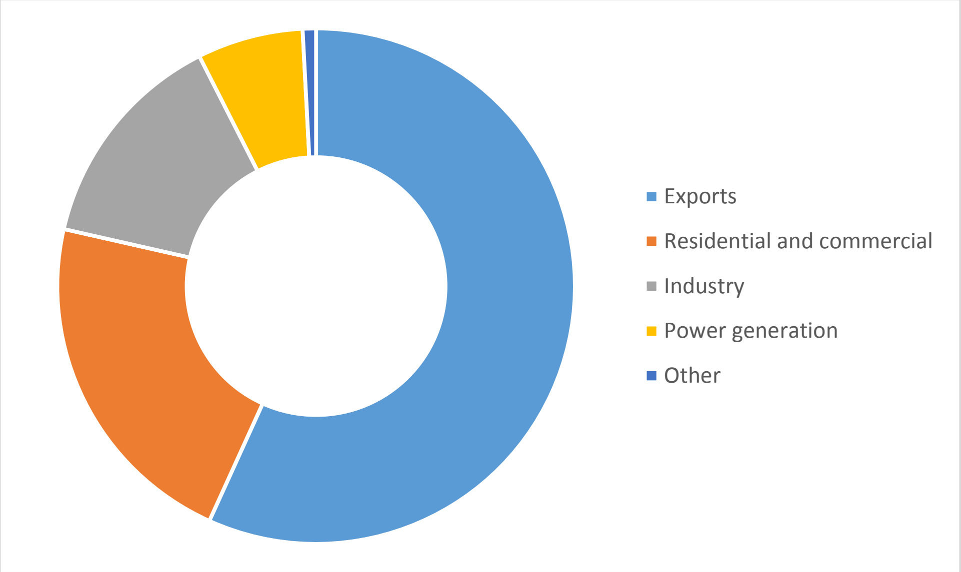
5 Dutch gas market context

This section provides background context on the physical fundamentals of the Dutch gas market, the role of Groningen, and the evolution of the TTF hub.

5.1 Physical fundamentals

Domestic demand in 2013 was around 40 bcm, in addition to which the Netherlands exported around 52 bcm. Figure 1 shows the split of consumption between sectors. The main traditional export markets have been Germany, Belgium and France, joined by Great Britain in 2008 with the opening of the Bacton-Balgzand interconnector.

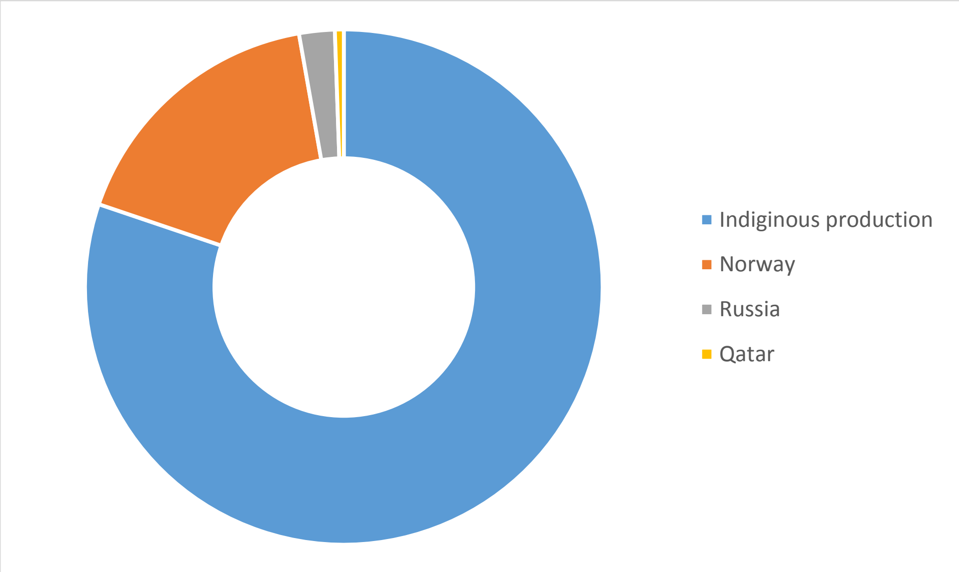
Figure 1 Gas consumption, 2013



Source: Eurogas

This was met by domestic production of around 73 bcm, together with around 18 bcm of imports, with the split shown in Figure 2.

Figure 2   Gas production and imports, 2013



Source: Eurogas

Dutch domestic gas production is dominated by Groningen, supplemented by volumes from a range of much smaller onshore and offshore fields. The Netherlands is a key landing point for Norwegian gas coming to the continent, and is well connected to its neighbouring markets, including an export-only interconnector to the UK. An LNG import terminal was opened in 2012.

The Groningen field was discovered in 1959 and has been the mainstay of the development of the Dutch and broader Northwest European gas markets. Its gas has a particular quality with a relatively high percentage of nitrogen. For this reason it has its own “Lo-Cal” midstream and downstream infrastructure. Most of the Dutch end users (especially households) use appliances that are adapted to this gas quality. The same goes for customers in certain export markets like Belgium, Germany and France. This infrastructure operates in parallel to a network system for “Hi-Cal” gas for production from the continental shelf, UK and Norway. We discuss the trading implications of this in Section 5.2 below.

5.2 Title Transfer Facility

Gas is traded between counterparties at a conceptual balancing point on the Dutch pipeline system, rather than at a specific physical delivery point, in common with the NBP in Great Britain and in line with the European Gas Target Model. In the Netherlands, this has taken the name of the underlying technical mechanism that was established to support this - the Title Transfer Facility (TTF). The Title Transfer Facility (TTF) is a virtual market place where market parties transfer gas that is already present in the system (‘entry-paid gas’) to another party. Using the TTF, gas that is brought into the Dutch grid via an entry point can change ownership before it leaves the Dutch grid at an exit point.

TTF was set up in November 2002 by Gasunie. At that time Gasunie was still an integrated network and supply business. This meant that the main competitor and supplier to other market parties was

running the market. This deterred potential new players. Also, Gasunie did not offer its main customers the choice of TTF as a delivery point. This kept volume away from the market.

In July 2004, the introduction of retail competition was completed and all consumers within the Netherlands were free to choose their own gas supplier. This, however, did not initially drive much change for trading at TTF. The control by Gasunie of low calorific gas supply limited competition in the market. The distribution companies had, however, started to buy gas at TTF for industrial and commercial customers and for power generation.

Retail competition drove up demand for gas quality conversion between the Hi-Cal and Lo-Cal systems. Gasunie controlled the blending facilities, and offered a limited capacity for booking by third parties. However, demand far exceeded the capacity offered. In Q4 2004, Gasunie had to ask the market to return surplus capacity. This redistribution relieved the capacity issues for 2004. However, at the same time Gasunie announced that conversion capacity for the next four years had been sold out, leading to questions in Parliament. The demand for Quality Conversion (QC) remained high in 2005 and 2006.

Gasunie was broken up in 2005 in line with European unbundling to create a network business, Gas Transport Services (GTS), and a supply business, GasTerra. Management of the hub sat with the network business. For the first time, the market was operated by a neutral player who had an interest in seeing the market grow.

In 2006, GTS started studies into an installation that could cover peaks in QC capacity and improve general availability. As a short term relief GTS introduced interruptible QC capacity and a program of purchase and sale of QC capacity.

In 2008, the Dutch regulator published its decision that QC would have to be made available by GTS as system service with socialised costs. This removed the physical constraint as a consideration for the traded market, and finally created one single gas market at the TTF, laying the path for real growth in trading volume. In the same year, GasTerra started reporting the volumes it had traded on TTF. The former incumbent also started to relocate the delivery point of its main supply contracts to TTF. In 2012, TTF broke through the number of 100 active players.

6 TTF Liquidity

6.1 Overview

The Dutch TTF hub is widely regarded today as one of the most liquid gas trading hubs in Europe. In this section we review the types of measures introduced in Section 4 as applied to the TTF, and explore the reasons why TTF liquidity has developed so strongly in recent years.

DG Energy publishes a high level view on European wholesale gas market developments as part of its Quarterly Report on European Gas Markets. In its report for the first quarter of 2015, it notes the following:

"*Gas hub liquidity reached record levels in the first quarter of 2015: total volumes traded on the main European gas hubs exceeded 10,000 TWh, an increase of 21% over the same period of 2014. In 2014, the annual increase was 18%. The UK NBP and Dutch TTF virtual trading points continue to have a dominant position.*

In 2014, the TTF overtook the UK NBP as the most liquid hub and this trend continued in 2015. In the first quarter of the year, traded volumes at the Dutch hub increased by a robust 44% year-on-year while they were flat at the NBP. The TTF benefited from its closer proximity to Central Eastern Europe in the context of the Ukrainian crisis."

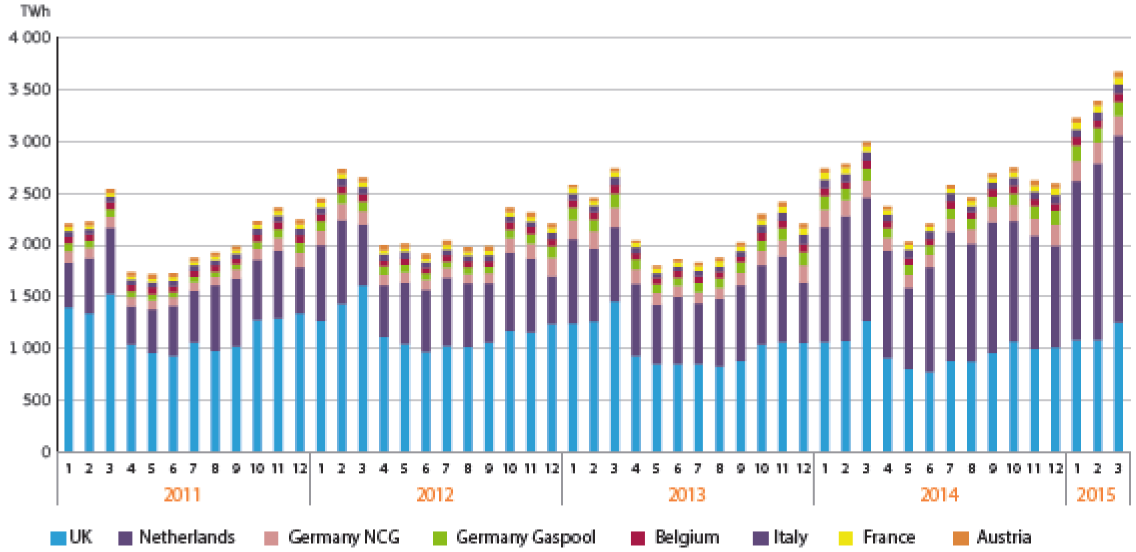
Overall, then, development of TTF liquidity has been extremely positive in the recent past. We explore the specific metrics we have previously identified.

6.2 Objective measures

Traded volumes

Figure 3, taken from the DG Energy report, shows clearly the dominance in volume terms of NBP and TTF. It also shows just how dramatic the rise of TTF liquidity has been over a four year period.

Figure 3 European hub trading volumes



Churn

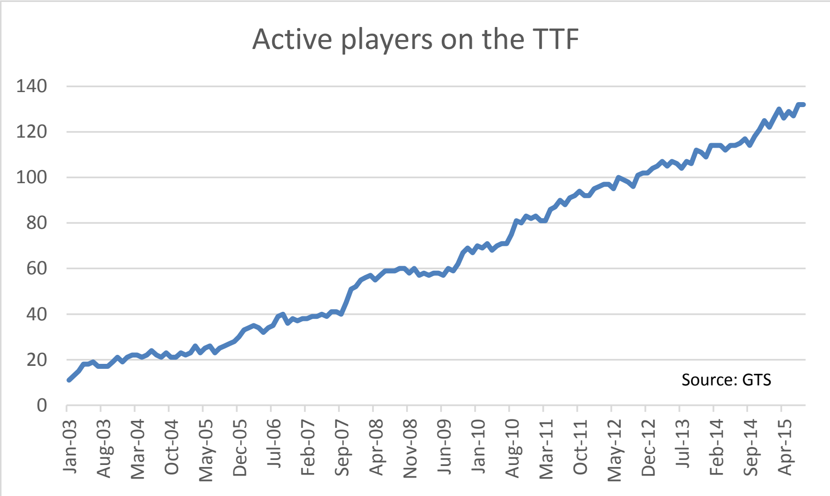
The TTF traded volumes presented above in 2014 represent a churn of close to 30 when compared to physical demand (so-called "gross market churn"). As churn rates above 10 are typically considered to be indicative of a "mature" market[1], this represents an impressive level. Churn in the first quarter of 2015 was higher still.

Number of parties

The number of active parties at the TTF has increased steadily over the last five years, with GTS recording a level of 132 in August 2015. The development is shown in Figure 4. Both the absolute level and the ongoing upwards direction of travel are very positive indicators.

[1] See for example *Continental European Gas Hubs: Are they fit for purpose?*, Oxford Institute of Energy Studies, June 2012, http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/06/NG-63.pdf

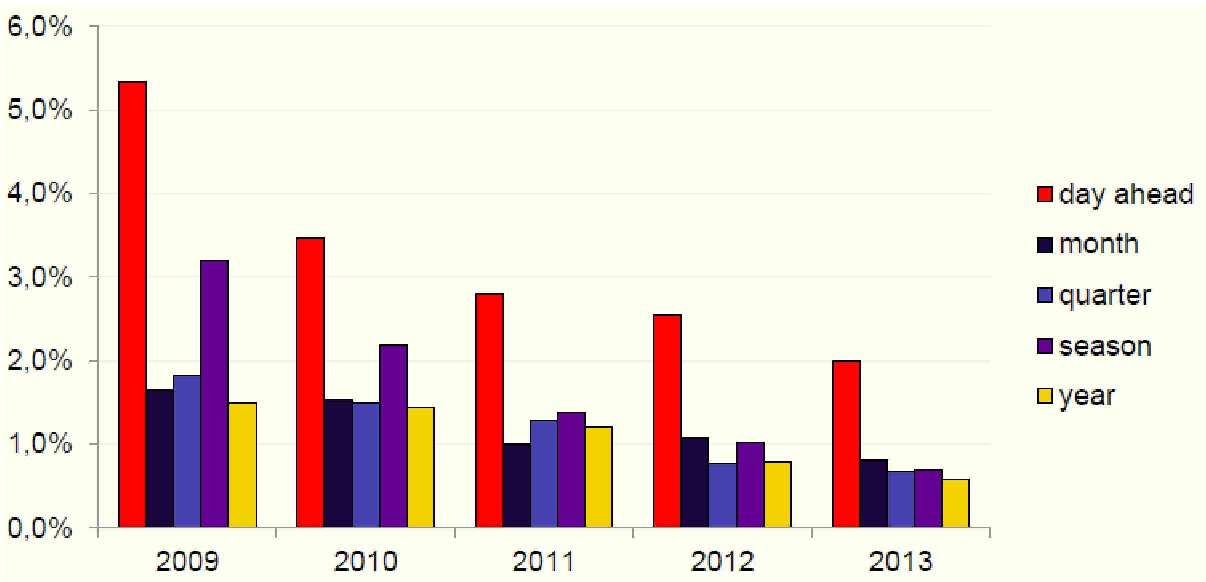
Figure 4 Active players on the TTF



Spread

The reduction in bid-offer spreads for all contracts at the TTF over the last five years has been marked, with spreads falling to under 1% for all contracts (except for day-ahead) in 2013. This is demonstrated in the following graph from ACM's annual report on liquidity in the gas and electricity markets.

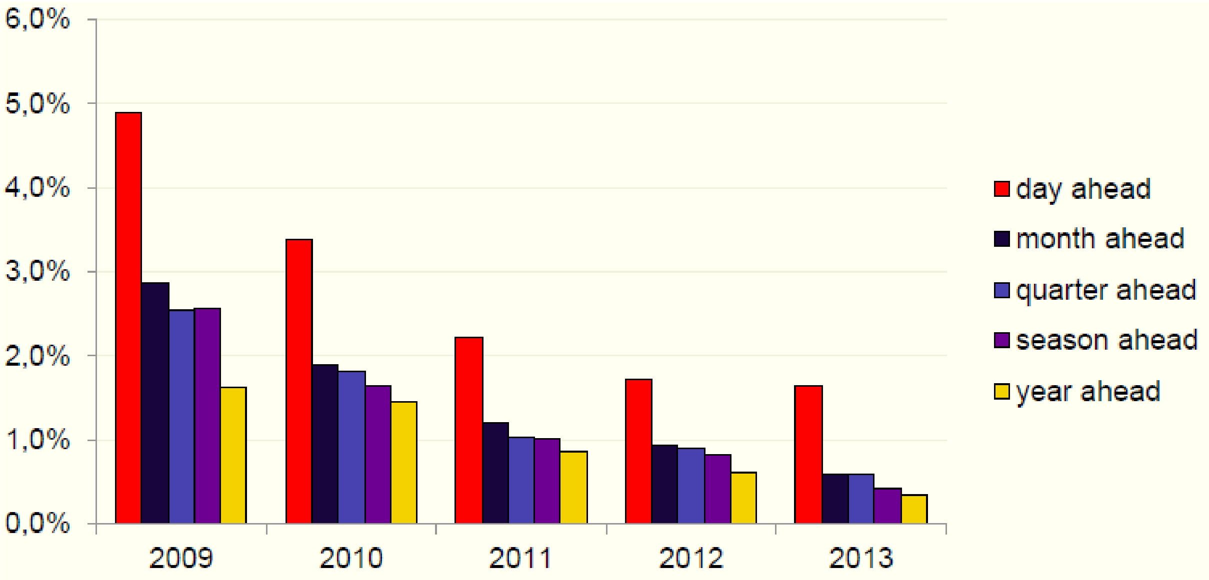
Figure 5 Annual average bid-offer spread for TTF products



Volatility

Price volatility has also fallen across all contracts from 2009 to 2013, as this further graph in Figure 6from the ACM report shows.

Figure 6 Annual average volatility for TTF products



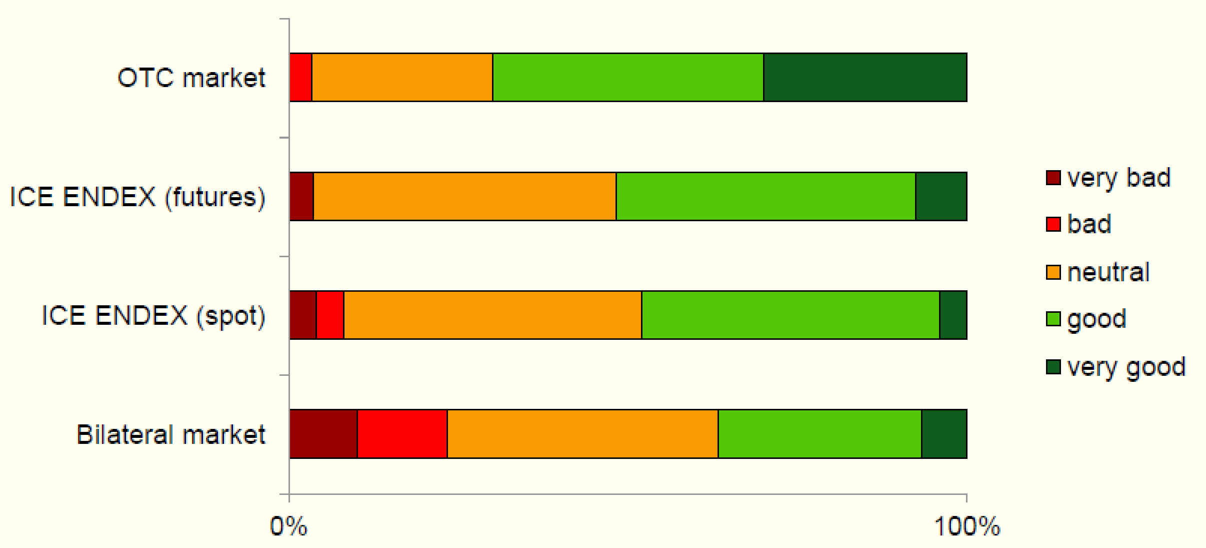
It is more difficult to draw direct conclusions in regard to liquidity from this data. The pattern of volatility across all key Northwest European hubs has been very similar, suggesting that this may be as much a result of changing fundamentals as well as improving hub liquidity. Nevertheless, the trend is positive in this regard.

6.3 Qualitative measures

It is clearly more difficult to provide objective measures of the qualitative aspects of liquidity. However, ACM's annual report usefully includes the results of a number of survey questions which help provide some gauge, particularly in terms of the directional changes between years.

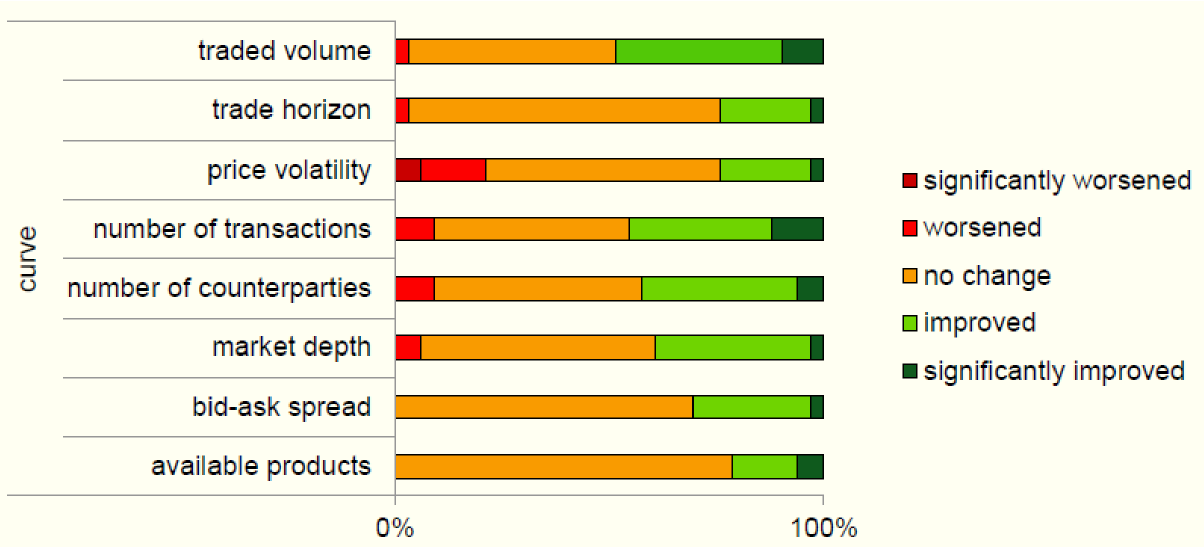
We show the graph below representing the results of a question asking respondents for their opinion on the transparency of prices in the market. The results show a broadly positive picture.

Figure 7 Respondent opinion of price transparency



In the same survey, participants were asked about how they felt curve liquidity had changed, showing material numbers indicating a positive improvement.

Figure 8 Respondent opinion over curve liquidity



Harder evidence is provided by the inclusion of TTF indexation in an increasing number of long term gas contracts between producers and European importers. This has been part of a transformation since around 2008 in the structuring of such contracts, which has seen extensive renegotiation between the counterparties replacing oil indexation with hub indexation[2]. The extent to which TTF is used as a reference price point in other markets is also growing, including, for example, the Italian market (both the trading community and the Italian authorities for their analyses). As noted above,

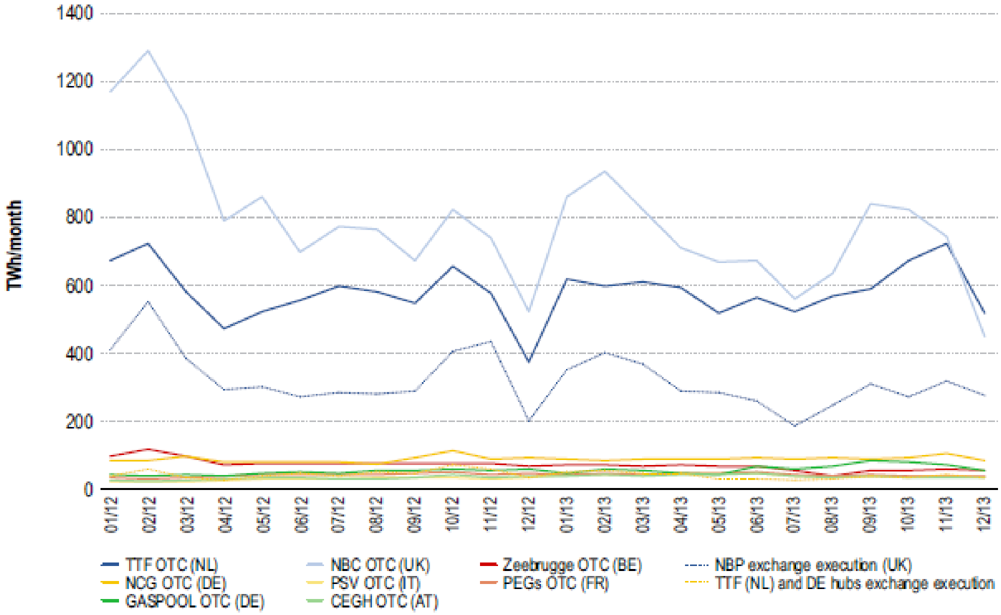
[2] See for example, CIEP's 2014 report on long term gas import contracts in Europe: http://www.clingendaelenergy.com/inc/upload/files/Ciep_paper_2014-08_web_1.pdf

this presents evidence of a growing level of trust and confidence in the market, another positive liquidity indicator.

6.4 Comparison with other hubs

ACER's market monitoring report of 2014 provides a graph on traded volumes at main hubs that splits out OTC and exchange based trading for the NBP.

Figure 9 Traded volumes at main EU hubs



Source: ICIS Heren, Trayport (2014)

Note: Over-the-counter trade (OTC) refers to the volumes traded among parties without the supervision, credit risk management and clearing function of an exchange operator. Exchange execution refers to those volumes supervised and cleared by an organised market operator.

On this basis, it can be seen that TTF overtook NBP in 2013 based on OTC traded volumes. What is striking too, however, is that the exchange traded market in the UK is still far larger than that at TTF. This can be seen as a legacy of the market development in different regions. The use of OTC trading on TTF reflects the traditional reliance on bilateral transactions on the continent. Also, it is likely that the larger influence of financial players in the UK market may play a role. Some financial players do not participate (materially) in the physical market and need the security of the exchange also for internal risk management purposes.

The graph also emphasises again the order of magnitude difference compared to other hubs. There may be a number of different factors for this. In Germany, for example, the significant role of a few large players in gas imports and production in the German market may limit liquidity growth. Similarly in France there are potential issues around concentration and the split over sub-market zones.

6.5 Liquidity drivers

A range of factors lie behind the evolution of liquidity at the TTF in recent years, summarised below:

- a virtual trading point on a system with substantial physical domestic production and import and export capability (the "gas roundabout"),
- the decision to socialise quality conversion between the Hi-Cal and Lo-Cal networks, creating a single traded market,
- the fact that TTF was able to gain "first mover advantage" on the Continent,
- a stable regulatory and political regime and commitment to competitive markets,
- the willingness of players in the Dutch market to help develop the desired liquidity, and
- the early successes resulting in TTF pricing being applied in other markets.

7 Benefits of a liquid gas market for the Netherlands and Northwest Europe

A well-functioning, liquid wholesale gas market combined with a predictable and transparent regulatory regime provide a number of key benefits to the Netherlands and North West Europe. We discuss these benefits below under three categories, namely:

- Direct wholesale market benefits
- Broader energy market benefits
- Broader economic benefits

7.1 Direct wholesale market benefits

A liquid wholesale market fosters competition across the value chain and provides the means for participants to manage their portfolios effectively.

Provides transparent wholesale prices

One of the characteristics of a well-functioning, liquid market is that prices are determined in a transparent manner. Transparent wholesale prices imply that current and prospective market participants can obtain price information easily, so they can compare costs of different product offerings. Furthermore, market participants will be able to understand how prices are set and may evolve under certain circumstances.

In markets with limited trading, it can be less difficult to "move the market" through a smaller number of trading actions. This leaves the market more prone to deliberate manipulation by players seeking to gain advantage for their portfolio by temporarily moving the apparent market price away from its fundamental level. Where churn is high, as we have seen for the TTF, manipulation is more difficult simply because a much higher level of trading is required to move the price, which is both costly and more open to detection.

Supports ability to transact at low cost

In a well-functioning liquid market, there will be a large number of buyers and sellers willing to transact at all times, as well as multiple potential routes to market. As a result, bid-offer spreads stay low in relation to the market price, and competition keeps other transaction costs down. This enables participants to manage portfolios efficiently, and drives lower overall energy supply costs for consumers.

Lowers new entry barriers

A liquid wholesale market helps ensure a low barrier to entry for participants, both upstream and downstream, by providing a straightforward and efficient means to buy or sell gas. This in turn results in greater competition, lower prices for consumers, more diverse product offerings and a higher degree of innovation.

As observed in the ACER/CEER report[3], in many European countries barriers to entry persist, hampering retail competition and consumer choice and contributing to increasing consumer prices for electricity and gas despite the economic downturn. In the Netherlands, the rapid growth of TTF suggests that barriers to entry at wholesale level are low at present.

Provides risk management tools

Physical players in the market – whether producers or suppliers – will be seeking to manage price exposure as a result of obligations they may have. In order to manage gas price risk market participants require a liquid pricing signal and need to have confidence in the market, such that they are able to execute hedging actions when required by the business. A liquid gas hub provides a capability to do exactly this.

7.2 Broader energy market benefits

A liquid wholesale market helps lower costs to consumers through efficient resource use and investment decisions.

Supports efficient resource use

In a well-functioning market, prices reflect underlying fundamentals. Prices perform a signalling function: they demonstrate where resources are needed and where not. High prices signal the need to expand output, the need to invest and/or innovate.

If a market functions well and prices reflect underlying economic costs then this should lead to an efficient allocation of resources: the product (eg gas) will go to the party who values it most, and hence is willing to pay the highest price.

Supports a well-functioning power market (and efficient cost of electricity)

A well-functioning wholesale gas market would be expected to have a positive effect on the power market. In the Netherlands, natural gas plays an important role in electricity generation with gas fired power plants making up approximately 70% of installed capacity[4].

The decision to operate a gas-fired power plant depends on the power-gas price difference (or spark spread). A transparent and liquid gas market thus helps to ensure that electricity dispatch decisions are in turn efficient, correspondingly supporting an efficient level of electricity prices.

With increasing physical volatility on the supply side of the electricity market as intermittent renewable generation is deployed, the need for this to be balanced is increasing, and this is often met through gas-fired generation. A liquid gas market is key in ensuring that the required flexibility can be delivered efficiently. The flexibility may physically be provided from a range of sources (including varying Groningen output, storage facilities, or changes to import or interconnector flows) but this can be "accessed" simply by transacting at the TTF.

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[3] ACER/CEER (October 2014), Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2013, p.7

[4] ACER/CEER (October 2014), Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2013, p.111

Supports efficient infrastructure development

Generally speaking, prices signal where and how much investment in production and general infrastructure is needed. This could be in the form of exploration and field development and import infrastructure (such as new pipelines and LNG processing facilities), driven by the wholesale price, storage, driven by seasonal price shape and volatility, or increased interconnection, driven by locational price differentials. In a liquid market, not only do transparent price signals enable participants to make efficient investment decisions, but the trading depth provides confidence in the ability to monetise and risk manage the assets once developed.

Enhances security of supply

A liquid market is a key indicator for investors, and hence will support timely investments. This should reduce the risk of supply shortages, and in turn the risk of excessive price spikes or, in a more extreme case, security of supply issues. Any such outcomes would be particularly costly for countries which are very reliant on gas, such as the Netherlands and North Western Europe, and used to a reliable, competitively priced supply of gas. As these countries becomes increasingly dependent on imports from outside Europe, and must attract gas supplies in the context of global markets, this will be particularly important. Where producers have a choice on the destination market for their gas, as will increasingly be the case for LNG, liquidity will be an important consideration, providing confidence in the ability to achieve fair value on delivery.

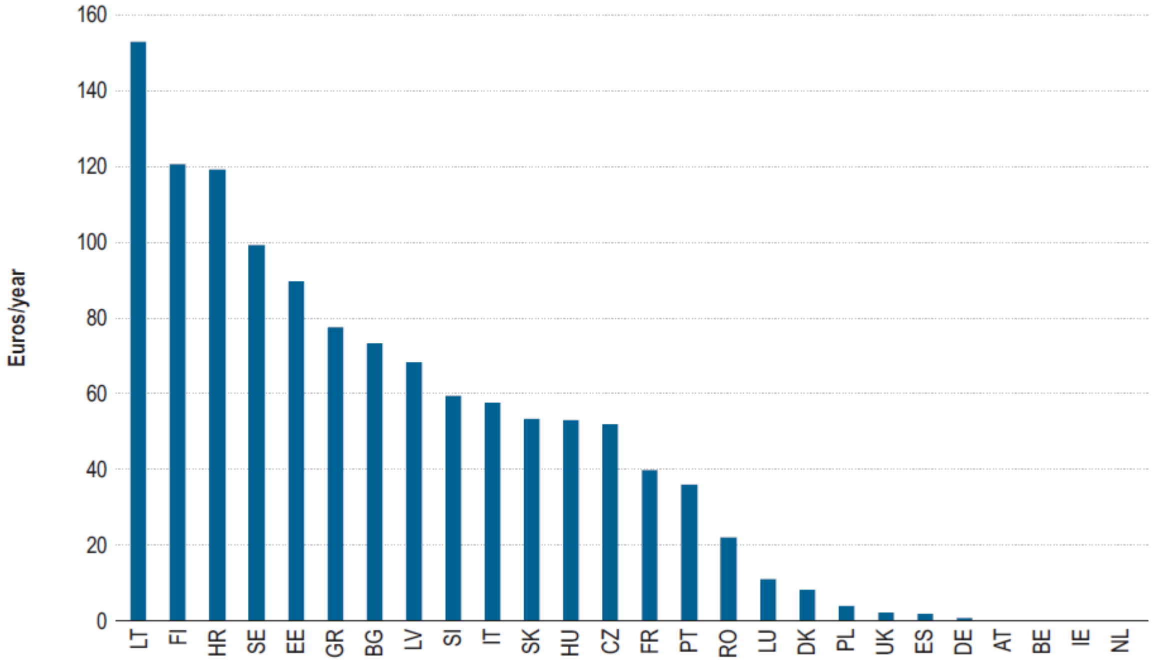
Lowers cost to consumers

In a liquid market, the price level would be expected to be lower than would be the case in a less liquid market. Lower wholesale gas prices may be expected to also result in lower retail prices. Lower energy prices positively affect macroeconomic stability and growth. This is especially the case in countries, like the Netherlands, which are highly dependent on gas. But this may also be expected to result in lower prices in North Western Europe.

To provide some view on the materiality associated with this, Figure 10, drawn from work by ACER[5], shows prospective gross welfare losses across the EU by comparing EU member state wholesale prices with the TTF. This provides an estimate of the potential saving these member states could achieve if all EU wholesale markets had similar liquidity and competition levels as the TTF. The highest calculated aggregated potential losses were for France (€1.2 billion) and Italy (€2.8 billion). The key message here is that – as the benchmark – TTF has helped the Netherlands minimise welfare losses of this type (and hence it shows as zero in the graph).

[5] ACER/CEER (October 2014), Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2013, p.178

Figure 10 Wholesale level of gross welfare losses per EU average household consumer in EU-26 2013 (euros/year)



7.3 Broader economic benefits

A liquid wholesale market supports industry competitiveness and economic growth.

Supports lower cost of production for industry

A well-functioning, liquid, wholesale gas market will result in lower wholesale gas prices than otherwise would have been the case. This matters for national competitiveness as the cost of energy affects the production costs of industries and services. Indeed, one of the key objectives in liberalising the energy industry was to improve the competitiveness of European industries by lowering the costs of energy.

This is even more relevant for a country like the Netherlands, because, compared to other EU countries, the Netherlands has:

- the highest gas penetration rate,
- the highest share of gas in primary energy consumption, and
- the highest consumption of gas per person.

In addition, gas was used in a greater percentage of power generation than in France, Belgium, the UK and Germany, and the ratio of industrial gas consumption to industry gross value added was also higher than in these countries (as well as Spain and Italy)[6].

Given the high level of reliance on gas for Dutch businesses and Dutch households alike, stable, predictable prices are especially important for the Netherlands. Price shocks or security of supply issues are likely to come at a significant economic cost.

Supports positive investment climate

Competitive energy prices are a key underpinning of economic growth because many production and consumption activities involve energy as a basic input. Energy is therefore one of the most important inputs for economic growth through production costs and the purchasing power of households.

Confidence that future demand for gas and electricity will be met in an efficient manner is therefore important in ensuring a positive investment climate more broadly. A liquid gas market is indicative of confidence in the appropriate levels of longer term energy investments, which in turn will provide confidence that future energy costs will be efficient, reducing any risk this may pose to broader investment decisions.

[6] For all statistics in this paragraph, see: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2010/12/08/dutch-gas-hub-strategy-on-the-netherlands/10183259-bijlage.pdf

8 Impact on TTF liquidity of recent and future developments

In an effort to reduce seismic activity in the north of the Netherlands, the Dutch Ministry of Economic Affairs has announced a cap on Groningen production of between 30 and 33 bcm for 2015 and between 30 and 35 bcm/year for the years thereafter. The higher production is allowed in case of high demand due to cold weather.

The Groningen production history shows that the field has been used to compensate for declining production from other fields. The objective seems to have been to keep Dutch over-all production at around 80 bcm/a. The increased production seems to have been used to supply significant volumes to the UK market. Other export markets have remained fairly constant.

Looking forward, the reduced production from Groningen will lead to a greater reliance on imported gas for Northwest Europe. This is easily within the capacity of import facilities in the Netherlands and elsewhere, and the liquidity at TTF provides confidence that this increased demand can be met through the market in aggregate.

The division of the market into Hi-Cal and Lo-Cal systems presents a more specific challenge in regards to the physical conversion infrastructure (although the traded market is protected from this issue given the requirement on GTS to manage quality conversion with socialisation of the costs). The continued demand for Lo-Cal gas both domestically and abroad, combined with reduced supply availability, places a heavy reliance on a sufficient capacity of blending facilities being available. In its Network Development Plan 2015, GTS concludes as follows: "Comparing the three demand situations with the trend in local production, and with the existing entry capacity, there is a clear need for additional gas from outside north-west Europe. … An increased need to convert high calorific gas into a quality suitable for the low calorific market, due to the decline of the Groningen field, leads to a need for investment in additional quality conversion facilities. … GTS is planning to build new large-scale facilities, including a nitrogen plant and a blending station, to facilitate this."

This is set against a broader Northwest European market background of increasing import dependency as production from the continental shelf declines. This is being replaced by a mix of pipeline imports and LNG. At the same time, the model of long term contracts between producers and suppliers is changing – both through the form of price indexation within contracts evolving to be based on a gas hub reference, and through increasing direct use of hubs for purchases and sales. Northwest Europe as a whole is therefore becoming increasingly reliant on well-functioning markets not just domestically but on a global basis. Under these new arrangements, liquid market hubs within the region are a fundamental part of ensuring both that there is a clear market for supplies of gas coming into Northwest Europe, as well as driving efficient price formation for consumers. This is consistent also with the implementation of the European Gas Target Model, which envisages a small number of liquid hubs, with harmonisation and simplification of the use of network capacity to reduce operational friction and basis risk between these and other delivery points.

The recent rise in the liquidity of the TTF is therefore an important element in ensuring that the market can respond effectively to the reduction in future Groningen production. It will be important that the underlying factors that have supported that liquidity are maintained through the transition, including sufficient blending capacity to avoid constraints emerging and separating the traded

market on a quality basis, as well as confidence that any other measures that may be considered are consistent with a strong wholesale market.

9 Conclusions

TTF is now the most liquid gas market in Europe. This brings a range of benefits to the Netherlands and to Northwest Europe more generally. The success of the TTF has arguably made the Dutch market, from a wholesale perspective, into the benchmark market for continental Europe. This is especially important given the high penetration and usage of gas in the country relative to other European markets.

The Netherlands benefits directly from strong TTF liquidity in the following important ways.

A liquid wholesale market fosters competition across the value chain and provides the means for participants to manage their portfolios effectively.

This comes about through:

- transparent wholesale price formation,
- ability to transact at low cost,
- low barriers to entry, and
- access to risk management tools.

A liquid wholesale market helps lower costs to consumers through efficient resource use and investment decisions.

This comes about through:

- price signals driving efficient allocation decisions,
- efficient cost and availability of fuel for electricity market (including on short timescales for balancing renewables),
- price signals for efficient infrastructure investment decisions,
- market confidence for suppliers and investors, enhancing security of supply, and
- efficient wholesale costs translating to lower costs for consumers.

A liquid wholesale market supports industry competitiveness and economic growth.

This comes about through:

- lower cost of production for industry, and
- improved purchasing power for households and confidence in energy supply supporting a positive investment climate.

The Groningen production cap, whilst clearly very materially reducing domestic production, does not present an aggregate supply and demand problem given the physical capacity for imports, and the strength of TTF liquidity is a positive element in ensuring that other supply sources fill the gap. There is a specific issue associated with the Lo-Cal constraints, but this can be addressed through sufficient blending capacity. In the broader context of increasing import dependence and evolving global markets, the central role of liquid wholesale hubs is key. If market participants are confident that TTF liquidity remains a central part of the vision for the Dutch gas market from a policy perspective,

this consistency should support its continued success, and the benefits that ensue to the Netherlands and Northwest Europe.